PATENT SPECIFICATION 682,320

Date of filing Complete Specification: March 6, 1950.

Application Date: Feb. 7, 1949. No. 3353/49.

Complete Specification Published: Nov. 5, 1952

Index at Acceptance:—Class 87(ii), A2e4a.

COMPLETE SPECIFICATION.

Method of Forming Passages in Concrete Beams or the like.

We, STRESSED CONCRETE DESIGN LIMITED, of 46, Great Marlborough Street, London, W.1, a British Company, do hereby declare the nature of this invention, (a communication from ARMAND BLATON and EMILE BLATON, both of 4, rue du Pavillion, Brussels, Belgium, both Belgian Subjects,) for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

In the construction of beams, girders, poles and like structural elements from concrete or similar material, it is sometimes necessary to form the beam or the like with a passage extending therethrough, generally from end to end, through which reinforcements may be passed, for example, a number or wires which may be highly tensioned to form a pre-stressed beam or girder. The reinforcing wires may be stressed, for example by the method described in co-pending Application No. 32722-3/46.

Whilst the formation of a straight passage through the beam presents no considerable difficulty, it is often desirable, in order to obtain the desired pre-stressing of the beam, that the passage should be curved from end to end. The present invention has for its object to provide a method whereby such passages, whether curved or straight, can be easily formed during the casting of the beam and in such a manner that the core forming the passage can be easily withdrawn after the beam has been cast.

It has previously been proposed to cast beams, girders, poles and like structural elements from concrete or similar materials having a passage extending therethrough by using a core of flexible and deformable material adapted to be reduced in cross-section when being removed longitudinally. It has also been proposed to make up a composite core from a number of small flexible and deformable core units.

According to the invention there is provided a method of casing beams, girders, poles and the like structural elements of concrete or similar material having a passage extending therethrough in which said passage is produced by the use of a core of flexible and deformable material adapted to be reduced in cross-section by pulling on an end therefor when being removed longitudinally, characterised in that the core is formed by placing a number of individual core members of similar cross-section adjacent one another, at least one of said individual core members being supported in the mould by stiffener means extending longitudinally thereof, said stiffener means being likewise withdrawn after the moulding.

In one form of the invention, the stiffener means comprises a member below the said core member and having flanges along its two longitudinal edges adapted to prevent lateral movement of the core member. This may be effected conveniently by making the stiffener member from thin flat metal strip and in one example of the invention in which the individual core members are mounted one above the other, such a stiffener member is provided below each core member, the flanges of a stiffener member between adjacent individual core members extending in both upward and downward directions and the flanges of a stiffener member located below the lowermost core member extending in an upward direction only.

Advantageously, the composite core is supported on transverse members arranged underneath the lowermost stiffener member while upper transverse members are located adjacent the upper surface of the uppermost core member to limit upward movement thereof. If desired, a further stiffener member may be interposed between the upper surface of the composite core and the transverse members.

In one embodiment according to the

invention, the individual rubber core members are made of substantially rectangular cross-section and may be provided with a central bore extending throughout their length. Each core is supported, during the casting operation, upon a metal strip positioned therebeneath and extending from one end to the other of the mould. This thin metal strip may be made of approximately the same width as the rubber core, and is preferably formed with shallow upstanding flanges along its two longitudinal edges, which flanges engage along the bottom edges of the sides of the core to locate it transversely with respect to the strip. Where such a strip is located between two adjacent core members mounted one above the other, it is preferably provided with flanges extending in both upward and downward direction.

When the strips and the rubber cores supported thereon are positioned within the mould, the desired curved path of the composite core may be determined by passing bolts or pegs through the side walls of the mould, the bolts or pegs lying both below the lowermost metal strip and above the uppermost rubber core member, the bolts or pegs lying below the strip serving to support the assembly, and the bolts or pegs lying above the rubber core holding it down against the metal strip so that the assembly follows the desired path. After the beam has been cast and set, each core is removed preferably by first withdrawing the metal plate and thereafter withdrawing the rubber core, although the two parts may, if desired, be removed in the reverse order.

In order to form passages of great depth, two or more of the individual rubber cores are superimposed one upon the other, preferably with the interposition of a further thin metal strip, which in this case, preferably has flanges extending both upwardly and downwardly along its edges so as to locate the two rubber cores directly one above the other. After the beam has been cast, the core assembly is removed by first withdrawing the lower plate, then the lower rubber core, then the intermediate plate, and finally the upper rubber core.

The invention is illustrated by way of example in the accompanying drawings.

Fig. 1 is an elevation, partly in section, showing the arrangement of a single core in a mould for a concrete beam to illustrate the principle of the invention.

Fig. 2 is a section on the line II—II of Fig. 1.

Fig. 3 is an elevation similar to Fig. 1 showing a form of core, in accordance with the invention, and

Fig. 4 is a cross-section of the core used in the embodiment of Fig. 3.

Referring now to the drawing, the core employed in the illustration of Figs. 1 and 2 is mainly constituted by a rubber member 1 of square cross-section substantially corresponding to the cross-section of the passage or duct to be formed in the beam and preferably provided with an internal bore or passage 2 this rubber core member 1 being placed in the mould so as to assume a slightly curved shape corresponding to the desired curvature of the passage in the finished beam. Transverse members constituted for example by bolts or pegs 3 passing across the mould, are provided underneath the core member to support it at various points along the mould, and similar transverse members 4 are arranged above the core member to hold the latter down on the members 3. A longitudinally extending flexible stiffener member 5 which is sufficiently flexible to follow the curvature of the core but substantially non-extensible compared with the rubber core proper, is employed in conjunction with the core member 1. In the illustrated example, the stiffener member 5 constitutes a thin flat metal strip which carries the core member 1 and rests on the members 3 and which, in order to locate the rubber core member 1 laterally, is provided along its two sides with shallow flanges 6. Both the rubber member 1 and the stiffener member 5 preferably extend through at least one end surface of the mould.

When the mould has been filled with a concrete material 7 and the latter has set sufficiently to allow the removal of the core, the core is withdrawn longitudinally by a pull at one end of it, this pull being exerted separately upon the rubber member and the stiffener member. The stiffener member may be withdrawn first and the rubber member subsequently, or alternatively the stiffener member may be left in the mould until the rubber member has been withdrawn. When a pull is exerted upon one end of the rubber member, the rubber member not only is extended longitudinally but at the same time contracts in its cross-wise direction thus freeing its surface from contact with the surrounding concrete, and as a consequence, the withdrawal can be readily effected. If, in the illustration the stiffener member is withdrawn after the rubber member, the removal of the latter relieves the pressure between the surfaces of the stiffener member and the adjacent concrete, thus permitting the stiffener to be withdrawn without difficulty. On the other hand if it is desired to withdraw the stiffener member first, the rubber member will yield sufficiently to allow the stiffener member to free itself from the concrete surface.

The external profile of the rubber member, though shown as a square, may be modified in accordance with the desired passage in the concrete beam or the like. The internal bore or passage 2 within the rubber core member

contributes to reducing the weight thereof and facilities its constriction during withdrawal.

According to this invention, a composite core is employed which is built up of two or more rubber core members 1, placed on top of each other or side by side. In the example illustrated in Figs. 3 and 4, the core comprises two rubber members 1*a* and 1*b*, placed one above the other, the lower member 1*a* resting on a stiffener member 5 similarly as in Figs. 1 and 2, while a further stiffener member 8 is placed between the two core members 1*a* and 1*b* so as to extend along the centre of the composite core. This further stiffener member 8, as shown, preferably has flanges 9, extending both upwardly and downwardly along its two edges, and serving to prevent lateral movement of the two core members 1*a* and 1*b* relative to one another. The composite core is supported similarly to the core of Figs. 1 and 2 on transverse members 3 arranged underneath the lower stiffener member 5, while upper transverse members 4 co-operate with the upper surface of the upper core member 1*b*. A further stiffener member (not shown) may be interposed between the upper surface of the core and the transverse members.

When the concrete has been filled into the mould illustrated in Fig. 3 and has sufficiently set, the composite core is withdrawn piece by piece, for example by withdrawing first the lower stiffener member 5, then the lower rubber core member 1*a*, thereafter the intermediate stiffener member 8, and finally the upper rubber core member 1*b*, though the order of withdrawal may be varied in order to obtain the best result in each case.

What we claim is :—

1. A method of casting beams, girders, poles and the like structural elements of concrete or similar material having a passage extending therethrough in which said passage is produced by the use of a core of flexible and deformable material adapted to be reduced in cross-section by pulling on an end thereof when being removed longitudinally, characterised in that the core is formed by placing a number of individual core members of similar cross-section adjacent one another, at least one of said individual core members being supported in the mould by stiffener means extending longitudinally thereof, said stiffener means being likewise withdrawn after the moulding.

2. A method according to Claim 1, in which the stiffener means comprises a member below the said core member and having flanges along its two longitudinal edges adapted to prevent lateral movement of the core member.

3. A method according to Claim 1 or 2, in which the stiffener member comprises a thin flat metal strip.

4. A method according to Claim 3, in which the individual core members are mounted one above the other with a stiffener below each core member and in which the flanges of a stiffener member between adjacent individual core members extend in both upward and downward directions and the flanges of a stiffener member located below the lowermost core member extend in an upward direction only.

5. A method according to any one of the preceding claims, in which the composite core is supported on transverse members arranged underneath the lowermost stiffener member while upper transverse members are located adjacent the upper surface of the uppermost core member to limit upward movement thereof.

6. A method according to Claim 5, characterised in that a further stiffener member is interposed between the upper surface of the composite core and the transverse members.

7. A method as claimed in any one of the preceding claims, in which the longitudinally extending stiffener members are associated with the individual core members prior to, and withdrawn after, the moulding.

8. The methods of casting beams, girders, poles and like structure of elements of concrete or similar materials, substantially as described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION.

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In the construction of beams, girders poles and like structural elements from concrete or similar materials, it is sometimes necessary to form the beam or the like with

a passage extending therethrough, generally from end to end, through which reinforcements may be passed, for example a number of wires which may be highly tensioned to form a pre-stressed beam or girder. The reinforcing wires may be stressed, for example by the method described in co-pending Application No. 32722–3/46.

Whilst the formation of a straight passage through the beam presents no considerable difficulty, it is often desirable, in order to obtain the desired pre-stressing of the beam, that the passage should be curved from end to end. The present invention has for its object to provide a method whereby such passages, whether curved or straight, can be easily formed during the casting of the beam and in such a manner that the core forming the passage can be easily withdrawn after the beam has been cast.

According to the present invention, the method of casting a beam or the like of concrete or similar materials with a passage extending therethrough, consists in casting the beam in a mould within which is positioned a core made of a length of rubber or like flexible material whereby, after the beam has been cast and set, the core can be withdrawn by pulling on its end. Due to the nature of the material from which the core is made, it stretches under the action of the pulling force and thus reduces its cross-sectional area whereby it becomes free from the surrounding concrete or the like and can be easily pulled out, even from a curved passage.

According to a feature of the invention, the core comprises not only the length of rubber-like material previously referred to but also a length of a flexible but substantially inextensible material, such as thin metal, which preferably extends beneath the rubber core to support the latter in the desired position within the mould and thus prevent or reduce the tendency of the rubber core to shift its position when the concrete is poured into the mould.

In one embodiment according to the invention, the rubber core is made of substantially rectangular cross-section and may be provided with a central bore extending throughout its length. This core is supported during the casting operation, upon a metal strip positioned therebeneath and extending from one end to the other of the mould. This thin metal strip may be made of approximately the same width as the rubber core, and is preferably formed with shallow upstanding flanges along its two edges, which flanges engage along the bottom edges of the sides of the core to locate it transversely with respect to the strip.

When the strip and the rubber core supported thereon are positioned within the mould, the desired curved path of the core may be determined by passing bolts or pegs through the side walls of the mould, the bolts or pegs lying both below the metal strip and above the rubber core, the bolts or pegs lying below the strip serving to support the assembly, and the bolts or pegs lying above the rubber core holding it down against the metal strip so that the assembly follows the desired path. After the beam has been cast and set, the core is removed preferably by first withdrawing the metal plate and thereafter withdrawing the rubber core, although the two parts may, if desired, be removed in the reverse order.

In order to form passages of greater depth, two or more rubber cores may be superimposed one upon the other, preferably with the interposition of a further thin metal strip, which in this case, preferably has flanges extending both upwardly and downwardly along its edges so as to locate the two rubber cores directly one above the other. The assembly is again held in position within the mould by transverse bolts or pegs and, after the beam has been cast, the core assembly is removed by first withdrawing the lower plate, then the lower rubber core, then the intermediate plate, and finally the upper rubber core.

Whilst particular embodiments of the invention have been described, it will be understood that various modifications may be made without departing from the spirit of the invention.

Dated this 7th day of February, 1949.

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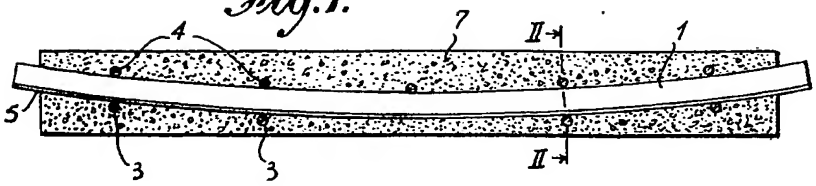
Chartered Patent Agents.

Abingdon: Printed for Her Majesty's Stationery Office, by Burgess & Son (Abingdon), Ltd.—1952.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2
from which copies may be obtained.

682,320 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig.1.



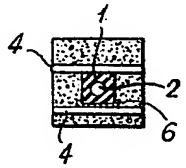


Fig.2.

Fig.3.

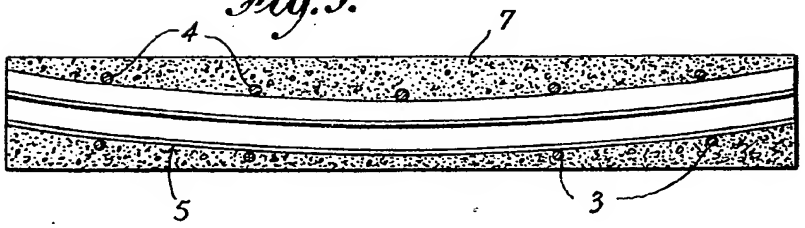


Fig.4.